

SPECIFICATION

BATTERY LOCKING APPARATUS FOR ELECTRONIC DEVICE

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

[0001] The present invention relates generally to battery locking apparatuses, and more particularly to a battery locking apparatus for an electronic device in which a battery is securely installed and easily removed thereto and therefrom.

2. RELATED ART

[0002] Presently, portable electronic devices such as notebook computers which are driven by batteries installed therein. Many battery locking apparatuses are designed to install and remove batteries to and from electronic devices.

[0003] US Pat. No. 5,716,730 discloses a battery case mounting structure for a portable electronic equipment. A recessed portion is formed in the battery case. A locking projecting body is formed on a main body of an electronic equipment and inserted in the recessed portion to fix the battery case. A guide portion supports the locking projecting body to be projectable from or retractable into the recessed portion so that the battery case is attachable to or detachable from the main body. A spring mechanism constantly biases the locking projecting body to project. An operating portion slides the locking projecting body to retract against a biasing force of the spring mechanism. The battery case is mounted on a mounting portion of the electronic equipment, and the operating portion is released. The distal end of the locking projecting body is inserted in the recessed portion of the battery case by the force of the spring, thereby fixing the battery case. However, because the portable electronic devices are typically carried about and

used at various locations, the locking projecting body can be easily moved or released due to vibration, impact or inadvertant operation.

SUMMARY OF THE INVENTION

[0004] Accordingly, an object of the present invention is to provide a battery locking apparatus for securely installing and easily removing a battery to and from an electronic device.

[0005] To achieve the above-mentioned object, a locking apparatus for a battery in accordance with a preferred embodiment of the present invention includes a base, a resilient member secured to the base, and a first lock member. The battery includes at least one locking portion. The resilient member includes a stop portion. The first lock member defines a first recess and a second recess, and includes at least one post. The at least one post is engaged in the at least locking portion of the battery. The first lock member is slidable between a first position and a second position. When the first lock member is slid to the first position, the stop potion of the resilient member abuts the first lock member in the first recess to secure the battery to the base. When the first lock member is slid to the second position, the stop potion of the resilient member abuts the first lock member in the second recess to release the battery from the base.

[0006] Other objects, advantages and novel features of the present invention will be drawn from the following detailed description of preferred embodiments of the present invention with the attached drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIG. 1 is an exploded, isometric view of a battery locking apparatus for electronic device in accordance with the preferred embodiment of the present invention;

[0008] FIG. 2 is a partly, enlarged, isometric view of the locking apparatus of FIG. 1, showing a resilient member secured to a third plate;

[0009] FIG. 3 is a partly, enlarged, isometric view of the locking apparatus of FIG. 1, showing a battery compartment;

[0010] FIG. 4 is an enlarged view of a circled portion IV of FIG. 3;

[0011] FIG. 5 is an exploded, isometric view of a first lock member and a second lock member of FIG. 1, together with a first spring, a second spring and a button;

[0012] FIG. 6 is similar to FIG. 5, but viewed from another aspect;

[0013] FIG. 7 is a partly view of the fully assembled view of FIG. 1, showing the locking apparatus when a battery is installed;

[0014] FIG. 8 is a partly sectional view of FIG. 7, but viewed from another aspect;

[0015] FIG. 9 is a partly view of the fully assembled view of FIG. 1, showing the locking apparatus when the battery is removed;

[0016] FIG. 10 is a partly sectional view of FIG. 9, but viewed from another aspect;

[0017] FIG. 11 is an exploded, isometric view of a battery locking apparatus for electronic apparatus in accordance with an alternative embodiment of the present invention;

[0018] FIG. 12 is an exploded, isometric view of a first lock member and a second lock member of FIG. 11, together with a first spring, a second spring and a button;

[0019] FIG. 13 is similar to FIG. 12, but viewed from another aspect; and

[0020] FIG. 14 is a partly view of the fully assembled view of FIG. 11, showing the locking apparatus when a battery is installed.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0021] FIG. 1 shows a battery locking apparatus in accordance with the preferred embodiment of the present invention. The locking apparatus comprises a battery 10, a base 20, a first lock member 40, a second lock member 60, a first spring 80, a resilient member 85, a button 90, and a second spring 100.

[0022] The battery 10 defines a pair of spaced slots 11 in a front wall thereof. Each slot 11 comprises a vertical guide portion 13 and a horizontal lock portion 12. Each guide portion 13 is bounded by a slanted face 14. A projection 15 extends from a rear wall of the battery 10.

[0023] Referring also to FIGS. 2-4, the base 20 comprises a peripheral flange 24. A battery compartment 21 is disposed adjacent the flange 24, for accommodating the battery 10 therein. The battery compartment 21 defines a pair of spaced first through holes 21a in a front wall thereof adjacent the flange 24, and a second through hole 21b in a rear wall thereof for receiving the projection 15 of the battery 10 therein. The flange 24 defines an opening 23 therein between the first through holes 21a. A first plate 25 substantially interconnects the front wall of the battery compartment 21 and the flange 24. The first plate 25 defines a U-shaped first cutout 26 therein. A second plate 30 extends rearwardly from the flange 24 at an upper extremity of the opening 23. The second plate 30 comprises a stop portion 32 at one end thereof, and defines a second cutout 31 in an opposite end thereof. A generally U-shaped third plate 29 extends rearwardly from the flange 24 adjacent the second plate 30. The third plate 29 defines a third cutout 27 in a

center portion thereof. A pair of spaced fixing tabs 28 extends from the flange 24, and is disposed between the flange 24 and the third plate 29.

[0024] The resilient member 85 has a symmetrical configuration, and comprises a central generally semi-circular stop portion 86. The stop portion 86 is extended through the third cutout 27 of the third plate 29 of the base 20. A pair of shoulders 88 extends from opposite ends of the stop portion 86 respectively. The shoulders 88 abut a main face of the third plate 29. A pair of slanted wings 87 extends from distal ends of the shoulders 88 respectively. The wings 87 abut respective fixing tabs 28 of the base 20.

[0025] Referring to FIGS. 5-6, the first lock member 40 has an elongate configuration. A pin 41 extends from an end of the first lock member 40, for extending through the first spring 80 and the first cutout 26 of the first plate 25 of the base 20. The first lock member 40 defines an L-shaped first hole 46 in one side of a center portion thereof. The first hole 46 is bounded by a first bottom 46a. A first post 48 protrudes from the first bottom 46a, for inserting in the second spring 100. The first lock member 40 also defines a first recess 43 and an adjacent second recess 42 in an end thereof opposite from the pin 41. The first and second recesses 43, 42 each have arcuate cross-sections. A protrusion 45 having an arcuate cross-section is disposed between the first and second recesses 43, 42. The stop portion 86 of the resilient member 85 is resiliently engaged in the first recess 43 or the second recess 42, according to whether the battery 10 is installed in or removed from the battery compartment 21. A horizontal stop bar 44 is disposed above the first and second recesses 43, 42, for preventing the stop portion 86 from being upwardly displaced. The first lock member 40 further defines a second hole 52 and an adjacent third hole 53 in an opposite side of the center portion thereof. The second hole 52 is bounded by a second bottom 52a. The third hole 53 is bounded by a third bottom 53a. A first gap 52b and a second

gap 53b are defined in the center portion of the first lock member 40, and span between the first bottom 46a and the second and third bottoms 52a, 53a respectively. A pair of spaced second posts 51 projects from the first lock member 40 at opposite sides of the second and third holes 52, 53 respectively, for being extended through the first through holes 21a of the battery compartment 21 of the base 20 and being engagingly secured in the lock portions 12 of the battery 10.

[0026] The first spring 80 comprises an enlarged portion 81 at an end thereof. The enlarged portion 81 abuts an inner face of the first plate 25 of the base 20, and an opposite end of the first spring 80 abuts an end of the first lock member 40.

[0027] The second lock member 60 comprises a front panel 61, and a plurality of parallel ribs 62 arranged thereon for facilitating manual manipulation. A through hole 63 is defined in a center portion of the second lock member 60. A pair of longitudinally disposed spaced latches 64 extends rearwardly from a rear side of the front panel 61. A pair of spaced horizontal forks 67 extends rearwardly from the rear side of the front panel 61 above and below the latches 64 respectively, substantially sandwiching the latches 64 therebetween. The latches 64 and the forks 67 are extended through the first and second gaps 52b, 53b of the first lock member 40 respectively, such that the latches 64 snappingly engage with the second and third bottoms 52a, 53a of the first lock member 40.

[0028] The button 90 comprises a cylindrical main body 91. The main body 91 defines a countersink 92 in a rear end thereof, for receiving the second spring 100 therein. An L-shaped arm 93 perpendicularly extends from the rear end of the main body 91, with an end of the arm 93 pointing forward.

[0029] Referring to FIGS. 7-8, in assembly, the resilient member 85 is secured to the third plate 29 of the base 20. The stop portion 86 extends through the third

cutout 27 of the third plate 29, the shoulders 88 abut the main face of the third plate 29, and the wings 87 abut the fixing tabs 28 of the base 20. The main body 91 of the button 90 is extended through the opening 23 of the base 20, and the arm 93 of the button 90 catches the second plate 30 of the base 20 so that the button 90 is suspended therefrom. The second spring 100 is received in the countersink 92 of the main body 91. The first spring 80 is attached to the pin 41 of the first lock member 40. The combined first spring 80 and first lock member 40 is secured to the base 20. The second posts 51 of the first lock member 40 are received in the first through holes 21a of the battery compartment 21. The pin 41 is received in the first cutout 26, and the enlarged portion 81 of the first spring 80 abuts the inner face of the first plate 25. The first post 48 is inserted in the second spring 100. The stop portion 86 of the resilient member 85 engages in the second recess 42 of the first lock member 40, with an upper part of the stop portion 86 abutting the stop bar 44. The second lock member 60 is attached to the first lock member 40. The latches 64 and the forks 67 of the second lock member 60 are inserted through the first and second gaps 52b, 53b respectively, with the latches 64 snappingly engaging with the second and third bottoms 52a, 53a. Simultaneously, the main body 91 of the button 90 extends through the through hole 63 of the second lock member 60.

[0030] When the battery 10 is installed in the battery compartment 21, the projection 15 of the battery 10 is inserted in the second through hole 21b of the battery compartment 21, and the second posts 51 of the first lock member 40 abut the slanted faces 14 of the guide portions 13 of the slots 11. The battery 10 is pressed upwardly, and the second posts 51 slide along the slanted faces 14. Accordingly, the combined first lock member 40, second lock member 60 and button 90 is moved in direction N until the stop portion 86 of the resilient member 85 rides over the protrusion 45 of the first lock member 40 to engage in the first

recess 43, so that the first lock member 40 is in a locked position. Simultaneously, the arm 93 of the button 90 is engagingly received in the second cutout 31 of the second plate 30 of the base 20, and the second posts 51 are received in the lock portions 12 of the slots 11 of the battery 10. Thus the battery 10 is secured in the base 20.

[0031] Referring to FIGS. 9-10, when the battery 10 is removed from the battery compartment 21, the button 90 is pressed inwardly and simultaneously the second lock member 60 is pushed in direction M. The second spring 100 is compressed, and the arm 93 of the button 90 is released from the second cutout 31 of the second plate 30. The first spring 80 is also compressed, and the combined first lock member 40, second lock member 60 and button 90 is moved in direction M until the stop portion 86 of the resilient member 85 rides over the protrusion 45 to engage in the second recess 42, so that the first lock member 40 is in an unlocked position. Simultaneously, the second posts 51 of the first lock member 40 are slid out of the lock portions 12 of the slots 11 of the battery 10, and slid out of the guide portions 13 along the slanted faces 14. Thus the battery 10 is removed from the base 20.

[0032] FIG. 11 shows a battery locking apparatus in accordance with the alternative embodiment of the present invention. The locking apparatus comprises a battery 10, a base 20, a first lock member 40', a second lock member 60, a first spring 80', a resilient member 85, a button 90, and a second spring 100. The battery 10, base 20, second lock member 60, resilient member 85, button 90 and second spring 100 are the same as those of the locking apparatus of the preferred embodiment. The first lock member 40' is secured to the base 20. The first spring 80' is attached to the first lock member 40'.

[0033] Referring to FIGS. 12-13, the first lock member 40' is similar to the first

lock member 40 of the preferred embodiment, except that the first lock member 40' defines a pair of holes 54' in an end thereof, instead of having the pin 41. Rear portions of the holes 54' are in communication with each other. The first spring 80' is similar to the first spring 80 of the preferred embodiment, except that the first spring 80' has a hook 82' at an end thereof. The first spring 80' comprises an enlarged portion 81' at an end thereof opposite from the hook 82'.

[0034] Referring to FIG. 14, in assembly, the enlarged portion 81' of the first lock member 80' abuts an outer face of a first plate 25 of the base 20, and the hook 82' engages in the holes 54' to attach the first spring 80' to the first lock member 40'. Subsequent assembly of the resilient member 85, the button 90, the combined first spring 80', first lock member 40', second spring 100 and second lock member 60, and the battery 10 to the base 20 is substantially the same as that described above in relation to the locking apparatus of the preferred embodiment.

[0035] It is understood that the invention may be embodied in other forms without departing from the spirit thereof. Thus, the present examples and embodiments are to be considered in all respects as illustrative and not restrictive, and the invention is not to be limited to the details given herein.